

# Resources

## Stormwater Information

Ferguson, Bruce. *Introduction to Stormwater: Concept, Purpose, Design*. 1998.

Woolworth, James W. *Out of the Gutter — Reducing Polluted Runoff in the District of Columbia*. Natural Resources Defense Council, July 2002.

*After the Storm — A Citizen's Guide to Understanding Stormwater*. US EPA 2003. [www.epa.gov/npdes/pubs/after\\_the\\_storm.pdf](http://www.epa.gov/npdes/pubs/after_the_storm.pdf)

*Stormwater Managers' Resource Center*. [www.stormwatercenter.net](http://www.stormwatercenter.net)

*Low Impact Development Center*. [www.lowimpactdevelopment.org/EPA03.htm](http://www.lowimpactdevelopment.org/EPA03.htm)

*Center for Watershed Protection*. [www.cwp.org](http://www.cwp.org)

## Rain Gardens and Rain Barrels

*Rain barrels may be purchased at local nursery, hardware, garden centers or from local community groups. If not available in your local area, search the internet for sources to purchase a rain barrel. The Alliance for the Chesapeake Bay and other conservation organizations often coordinate rain barrel workshops. Check our Web site or contact one of our offices for more information.*

*Clean Virginia Waterways (How to Build A Rain Barrel)*. <http://www.longwood.edu/CLEANVA/rainbarrels.htm>

*Rain Gardens (A how-to manual for homeowners)*. <http://learningstore.uwex.edu/pdf/GWQ037.pdf>

## Roof Gardens/ Greenroofs

*Building Green: A Guide to Using Plants on Roofs, Walls and Pavements*. The London Ecology. 1993.

*Urban Agriculture Notes*. [www.cityfarmer.org/sub-rooftops.html](http://www.cityfarmer.org/sub-rooftops.html)  
<http://www.greenroofs.com/Greenroofs101/index.html>

## Conservation Landscaping

*Alliance for the Chesapeake Bay*. [www.AllianceChesBay.org](http://www.AllianceChesBay.org)

*National Wildlife Federation*. [www.nwf.org](http://www.nwf.org)



This publication has been developed by The Alliance for the Chesapeake Bay, a regional non-profit organization that builds and fosters partnerships to restore and protect the Bay and its rivers.



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# Taking Care of Stormwater

## A BayScapes Guide for Homeowners

*This guide is designed to help you understand and implement practices in your own backyard and community to reduce the impact of stormwater runoff in your watershed.*

*BayScapes promote environmentally-sound landscaping practices at homes, businesses and public spaces that conserve water, prevent pollution and create wildlife habitat for the benefit and restoration of our local waterways and the Chesapeake Bay.*



beneath lawns, sports fields and pastures also create unexpected impervious areas.

## What is stormwater runoff?

Stormwater runoff is water from rain, melted snow or irrigation that does not soak into the ground but flows directly into local waterways without being treated.

Impervious surfaces are non-porous areas such as parking areas, streets and rooftops that prevent or retard water from entering the soil. Compacted soils



## Why is stormwater a problem?

Highly developed urban and suburban areas have a large percent of impervious surfaces such as rooftops, driveways, sidewalks and parking lots. Many streams in these communities have water quality issues that can

reduce their recreational value and harm wildlife and insects that depend on them to survive.

Traditional drainage systems concentrate and quickly remove runoff with gutters, curbs, storm sewers, pipes, and paved channels. These systems create a large flow of fast-moving and sometimes highly polluted water discharging into local rivers — causing erosion, flooding and unstable stream channels. Pollutants can include litter, pet waste, vehicle fluids and lawn fertilizers and pesticides.

## What can you do?

You can adopt and implement conservation landscaping in your backyard and community.

BayScapes is a program developed by the Alliance for the Chesapeake Bay and the U.S. Fish and Wildlife Service to teach landscaping and conservation practices that will help protect the Chesapeake Bay watershed.

BayScaping reduces air and water pollution by limiting the need for mowing and reduces pesticide, herbicide and fertilizer use. BayScaping also provides food and shelter for wildlife — butterflies, songbirds and small mammals, to name a few — by replacing some of the millions of acres of habitat lost to development and changing land uses.

*This brochure is intended to serve as an introduction to simple stormwater management practices that you can implement in your own backyard to help reduce the impact of stormwater runoff. Solutions to neighborhood and community runoff issues may require the support and expertise of local planning officials. By learning more about these alternative design methods, you can help promote these practices in your own community.*

## Alternatives to Impervious Surfaces

The following options are some of the most common alternatives to impervious surfaces on personal property and in the community.

## Natural resource preservation and conservation landscaping

Preserving the natural landscape can improve the marketability of a community and homes within it. Existing wooded areas, mature trees and natural terrain provide an attractive appearance along with recreational amenities. Landscaping with plants native to the Bay region's climate and soil conditions (conservation landscaping), requires less water, fertilizer, pesticides and maintenance than non-native plant varieties in ornamental gardens.

## Plant More Trees

According to the American Forestry Association, a single urban tree provides a benefit of \$273 per year. Trees provide many benefits: energy savings by reducing heating and cooling costs; sheltering and feeding wildlife; cleansing the air by absorption of carbon dioxide and nutrients; and reduction of the impacts of stormwater runoff by intercepting rainfall and slowing runoff. The roots of a tree also help to hold the soil in place, thus reducing erosion.



**Grass Swales** are an alternative to the curb and gutter system. Grasses or other low-growing vegetation are planted to reduce runoff velocity and allow filtration, while high-volume flows are safely channeled into a storm sewer or retention basin. Native plant species such as white ash, red cedar, chokeberry, sunflowers and switch grass, which tolerate salt spray and

snow compaction in the winter months, can be planted along roadside swales and add beauty and wildlife habitat.



## Decks, Patios and Pathways

These areas can be constructed with pervious materials that allow water to be absorbed into the ground. Wood, stone, cobble, loosely laid brick and paving blocks are some of the materials that can be used in the landscape.

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# Rain Gardens



**What is a Rain Garden?**  
A rain garden is a unique garden strategically located to intercept stormwater and allow it to soak into the soil, where it is filtered and cleaned by plants, soil and bacteria.

A rain garden allows about 30-percent more water to soak into the ground compared to a conventional lawn. These gardens are designed to treat and filter

stormwater runoff in four to six hours after a rainfall event; therefore, they will not become a breeding area for mosquitoes.

### Benefits

- Increasing the amount of water filtering into the ground and recharging the groundwater supply, while reducing the amount of pollutants such as sediment and nutrients from entering local waterways.
- Providing valuable wildlife habitat and educational opportunities to observe birds and butterflies visiting the garden.
- Reducing stream-bank erosion by decreasing the volume and power of a storm’s runoff.
- Adding beauty with an attractive, low-maintenance landscape feature

### How does a rain garden work?

A rain garden has four zones: the ponding area, middle zone, outer zone and berm area:

- The *ponding area* is the wet area where the runoff enters the rain garden from the outer zone. The plants that grow in this area must tolerate standing water *and* fluctuating water levels.
- The *middle zone* is slightly drier and the plants must tolerate fluctuating water levels.
- The *outer zone* includes the berm and is the driest of the three zones. The plant material selected for the outer zone must be able to tolerate normal moisture conditions most of the time.
- The *berm area* is a low “wall” that surrounds the garden on three sides. Its function is to hold the water in during a storm event.

Within the garden, a mulch /organic layer plays an important role in removing harmful chemicals. Shredded hardwood mulch is recommended because it allows for a greater surface area for absorption and resists flotation and washout. The planting medium (available premixed at some nurseries and landscaping companies) should be a good mixture of 20% leaf mulch, 50% sandy soil and 30% topsoil so water can easily soak into the ground.

These gardens have similar maintance requirements as other landscaped areas around your home. However, if sediment builds up in the garden, it must be removed because it will reduce the rain garden’s filtering ability. Do not use this area for composting organic yard waste.

### Design and Plant Material

Each garden design depends upon the topography, soil permeability, drainage basin, volume and velocity of water flow on the site. Place your rain garden at least 10 feet from the foundation so infiltrating water does not seep into the building.

Build the garden in full or partial sun — the sun helps evaporate the excess water. Choose hardy, native plants for your garden. Visit your local nursery for suggestions.

# Rain Barrels



Stormwater can be collected from rooftops by diverting downspouts into rain barrels. Rain barrels help slow the flow of runoff from impervious surfaces and store water for future land-scape uses. Multiple rain barrels can be linked together to increase storage capacity.

### Why have a rain barrel?

Lawn and garden watering make up nearly 40 percent of a typical household’s water use during the summer growing season. A rain barrel could save most home-owners about 1,300 gallons of water during the summer months, lowering water bills significantly. The water collected and stored in the rain barrel can also be used for washing cars and cleaning windows, but not for drinking.

### Where can I get a rain barrel?

You can purchase or order a rain barrel at most local lawn and garden centers. You can also make your own using a large trash can or food grade container (i.e. 55-gallon drum). Do not use containers that have previously stored chemicals, motor oils or other toxic products. See the *Resource Section* for online sources to purchase a rain barrel or learn how to make one.

### How do I install a rain barrel?

Most are easy to install; however, installation methods vary depending upon the brand. Installation of a typical rain barrel will involve disconnecting and cutting off a portion of the downspout and redirecting it into the top or side of the barrel. The rain barrel should be placed on concrete blocks, bricks, etc. for ease of attaching a hose to the spigot. A tight-fitting, small-mesh screen should be placed on top of the rain barrel to prevent mosquito breeding. Always be sure to empty your barrel before winter freezes and turn it upside down to prevent water collecting in it.

### What is a cistern?

A cistern is a large rain barrel that has a greater holding capacity and can be installed either above or below ground, depending on the model. A little more up-front engineering and physical space may be needed when installing a cistern. Water from an outdoor cistern may be used to water your lawn and garden. Indoors, this stored water can be used for flushing toilets, washing clothes, and for drinking if filtered adequately. A cistern is considerably more expensive than a rain barrel, but it can provide for more of your water needs and may pay for itself in the long run.

# Roof Gardens

Roof areas may represent up to 50 percent of the impervious surface in an urban or suburban community, but planting vegetation on a specially designed rooftop can capture rooftop runoff. The vegetative layer retains water both in the soil and the vegetation. This water is later released through evapotranspiration. Plants can be installed in containers to make up a simple roof garden. Greenroofs, on the other hand, involve planting vegetation directly on a specially constructed roof surface and require engineering expertise.

### Benefits

There are many benefits of roof gardens and greenroofs. In fact, a recent study estimated that the greening of all of Chicago’s rooftops would produce \$100 million in saved energy annually. One inch of rain on a 1,000 square foot roof generates about 623 gallons of water. Other benefits include:

- Reduced stormwater runoff (up to 50%),
- Improved air and water quality,
- Reduced energy consumption (by insulating buildings),
- Increased habitat for birds and beneficial insects,
- Sources of urban food production,
- Enhanced building value and extended roof life,
- Reduced heat island effects and sound barrier.

### Design and Plant Material

The slope of your roof will determine what kind of roof garden you can have. Consult a licensed engineer regarding the load carrying capacity of the roof to ensure that the structure will support your garden design. A low cost way to start a roof-top garden on a flat roof is to use containers, such as plastic swimming pools.

Plant material for a roof garden should tolerate dry, hot and sunny growing conditions. Certain native wildflowers, grasses and shrubs will also survive in a raised bed contain-ing at least eight inches of soil (i.e. plastic swimming pool). Vegetables for human consumption can be grown if a heavy layer of organic mulch is applied.

Before planting, consider the following:

- Can the roof support a garden? Consult an engineer to determine if your roof can support the weight.
- Will the roof garden consist of a variety of containers or a greenroof that is professionally designed and installed?
- If planning a roof garden consisting of containers, what type of plants will be planted?
- If the plants last more than one season, is there a way to protect them from freezing temperatures and drying winter winds?
- Who will maintain the garden?

